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För Patent- och registreringsverket
For the Patent- and Registration Office

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NEW PEPTIDES AND USE THEREOF

Field of the invention

The present invention relates to new peptides and to use thereof, in particular for treatment and/or prevention of infections, inflammations and/or tumours.

Background art

It has for a long time been known that human milk in several ways is anti-inflammatory due to the fact that it is poor in initiators and mediators of inflammation but rich in anti-inflammatory agents (see e.g. Goldman A. S., et al., Anti-inflammatory properties of human milk, Acta Paediatr. Scand. 75:689-695, 1986). Human milk also contains several soluble anti-infective components, such as lactoferrin (see e.g. Hanson L. Å., et al., Protective factors in milk and the development of the immune system, Pediatrics 75:172-176, 1983).

Lactoferrin is a single chain metalbinding glycoprotein with a molecular weight of 77 kd. It has been found that the structural domain of lactoferrin responsible for the bactericidal properties is a pepsin-cleaved fragment called lactoferricin (see e.g. Bellamy W., et al., Identification of the bactericidal domain of lactoferrin, Biochim. Biophys. Acta 1121:130-136, 1992, and Bellamy W., et al., Antibacterial spectrum of lactoferricin B, a potent bactericidal peptide derived from the N-terminal region of bovine lactoferrin, J. Appl. Bact. 73:472-479, 1992).

Lactoferrin receptors are found on many types of cells including monocytes and macrophages, lectin-stimulated human peripheral blood lymphocytes, brush-border cells, and tumour cell lines.

Several patent publications describe the possible use of lactoferrin for treatment of infections or inflammations. In WO 98/06425, e.g., it is disclosed that lac-

toferrin and lactoferricin can be used for treatment and prevention of infections, inflammations and tumours.

EP-A-0 629 347 describes an antimicrobial agent containing (A) lactoferrin hydrolysate and/or one or more of antimicrobial peptides derived from lactoferrins, and (B) one or more compounds selected from the group consisting of metal-chelating protein, tocopherol, cyclodextrin, glycerin-fatty acid ester, alcohol, EDTA or a salt thereof, ascorbic acid or a salt thereof, citric acid or a salt thereof, polyphosphoric acid or a salt thereof, chitosan, cysteine, and cholic acid as the effective components thereof. This antimicrobial agent is intended for treatment of products, and especially for safely treating e.g. food and medicines. The agent according to this publication is thus a new preservative. In the publication several peptide sequences are given and some of them resemble the peptides according to the invention, although there are several important differences.

Even though native human lactoferrin and lactoferricin have been shown to have desired anti-inflammatory, anti-infectious and anti-tumoral properties they cannot be used clinically on a broad basis since they are very expensive substances due to high production costs.

Summary of the invention

The object of the present invention is to provide new peptides which can be used for the same purposes as lactoferrin and/or lactoferricin and which will have the same, or better, effects although being much cheaper to produce.

The aim of the studies leading to the present invention was to design new peptides which could be taken up from the intestines. It has been shown that humans in their brush border membrane have receptors which can bind to human lactoferrin (see e.g. Lönnerdal B., Lactoferrin receptors in intestinal brush border membranes, Adv. Exp. Med. Biol., 1994, 357:171-175). It has also been shown

that bovine lactoferrin does not bind to these receptors. The new peptides should therefore resemble human lactoferrin or human lactoferricin but they should also be easier and especially cheaper to produce. Furthermore, they should be essentially as efficient as, or preferably more efficient than human lactoferrin or human lactoferricin in treatment and prevention of infections, inflammations and tumours.

It was found that peptides consisting of 11-17 amino acids comprising the sequence with SEQ ID NO 1 given in the appended sequence listing have the desired properties. The peptides according to the invention correspond to the sequences that begin with one of the amino acids in positions 15-21 and end with the amino acid in position 31, counted from the N-terminal end, in the sequence constituting human lactoferrin, although some of the amino acid residues may be modified in comparison with those of human lactoferrin. The sequence according to SEQ ID NO 1 corresponds to the sequence formed of the amino acids in positions 21-31 in which some amino acids may be modified.

A plausible mechanism for the uptake of these new peptides in the human body is that they are taken up in the intestine through binding to the above mentioned specific lactoferrin receptors and are then transported through the circulation. However, the invention is in no way limited to this mechanism.

Thus, the present invention relates to new peptides with the sequences given in the appended sequence listing, and to functionally equivalent homologues or analogues thereof.

Furthermore, the invention relates to medicinal products and food stuff, especially infant formula food, comprising said peptides.

The invention also relates to use of said peptides for the production of medicinal products for treatment and prevention of infections, inflammations and tumours.

The peptides according to the invention are fungicidal and bactericidal, and can thus be used for other applications when substances with such properties are desired. They may for example be used as preservatives.

The characterising features of the invention will be evident from the following description and the appended claims.

Detailed description of the invention

Thus, the invention relates to peptides consisting of 11-17 amino acids, comprising the sequence:

F-X-W-X-R-X-M-R-K-X-R

(SEQ ID NO 1)

or functionally equivalent homologues or analogues thereof.

The single-letter and three-letter symbols used herein are well known to man skilled in the art, and have the following meaning: F = Phe = phenylalanine, W = Trp = tryptophan, R = Arg = arginine, M = Met = methionine, and K = Lys = lysine. X = Xaa = any amino acid.

The amino acids denoted by X or Xaa are preferably, independently of each other, glutamine (Q or Gln), lysine (K or Lys), aspartic acid (D or Asp), asparagine (N or Asn), or valine (V or Val).

Some of the peptides according to the invention are "capped", which means that the N-terminal end of the peptide is acetylated, and the C-terminal end is amidated. The capped version of SEQ ID NO 1 is thus:

Ac-F-X-W-X-R-X-M-R-K-X-R-NH_2

In this sequence Ac and NH_2 denotes an acetyl (CH_3CO-) group and an amino group, respectively.

The advantage of the capped version, i.e. the sequence in which the amino and carboxy terminal ends have

been reacted with acetylimidazole to form the amide CH_3CONH- or AcNH- and the free COOH at the carboxy terminal end has been transformed into $CONH_2$, is that this peptide is neutral at the ends and thus has drastically changed electrostatic properties. Assuming that the receptors bind the corresponding sequences of human lactoferrin where there are no N- and C terminal charges, the capped peptides should bind better as they in this respect resemble the native protein more than uncapped peptides. Under physiological conditions at a pH of approximately 7, free amino and carboxy terminals would be ionised and the peptide would thus carry an extra positive and an extra negative charge.

A preferred group of peptides according to the invention consists of 14 amino acids. Those peptides correspond essentially to the sequence formed by the amino acids in positions 18-31, counted from the N-terminal end, in the sequence constituting human lactoferrin, wherein some amino acids have been modified. The peptides in this group have the sequences SEQ ID NO 8-19.

The peptide according to the invention mostly corresponding to this part of human lactoferrin is the peptide with SEQ ID NO 8 given in the appended sequence listing. The capped version of this sequence has SEQ ID NO 9.

The amino acid in position 3 in this sequence, i.e. a cysteine (C or Cys) may be replaced by an alanine (A or Ala) or a lysine, the amino acid in position 5, a glutamine, may be replaced by a lysine, the amino acid in position 9, an asparagine, may be replaced by an aspartic acid or a lysine, and the amino acid in position 13, a valine, may be replaced by an aspartic acid.

When the peptide according to the invention comprises a cysteine, as the peptides with SEQ ID NO 4-9 and 20-25, it may be advantageous to replace this cysteine by a acetamidomethyl-cysteine in order to avoid that the peptide forms a disulphide bridge with another peptide

comprising a cysteine. However, the amino acids glutamine and valine may then not be replaces as described above.

When the peptide according to the invention comprises a lysine separated from an aspartic acid by three amino acids the lysine and the aspartic acid may form a lactam, as in SEQ ID NO 12 and 13, wherein a lactam is formed between a lysine in position 5 and an aspartic acid in position 9. It is also possible to obtain a dilactam, as in SEQ ID NO 18 and 19, wherein a lactam is formed between a lysine in position 3 and an aspartic acid in position 7 and another lactam is formed between a lysine in position 9 and an aspartic acid in position 13. The lactam formation forces the peptide to adopt a three-dimensional structure that resembles that of the corresponding fragment of human lactoferrin and this may accomplish better binding of the peptide to the lactoferrin receptor.

A major advantage of the peptides according to the invention is that they form the part, or a modified version of it, of the lactoferricin fragment of the human lactoferrin protein which the inventors have found to be active with regards to the invention.

An other advantage of the peptides according to the invention is that they are relatively short which means that they are cheaper and more easy to produce than longer peptides, such as lactoferrin itself.

The peptides according to the invention may be either of natural origin, e.g. derived from human lactoferrin, or synthetically produced.

Apart from the above specified peptides it is also possible to use functionally equivalent homologues or analogues thereof.

The peptides according to the invention is suitable for treatment and/or prevention of infections, inflammations and/or tumours. The term "treatment" used herein refers to curing, reversing, attenuating, alleviating, minimising, suppressing or halting the deleterious ef-

fects of a disease state, disease progression or other abnormal condition, and the term "prevention" used herein refers to minimising, reducing or suppressing the risk of developing a disease state or progression or other abnormal or deleterious conditions.

The infections treatable with the peptides or medicinal products according to the invention include infections caused by all kinds of pathogens, such as bacteria, viruses, fungi, etc.

It is also possible to treat different types of inflammations. Inflammation is a complex phenomenon marked i.a. by abnormal "redness" and swelling of tissues and organs, pain and heat in affected areas, capillary dilatation, leucocyte infiltration, etc. Inflammation is primarily caused by exposure to bacterial and other noxious agents and physical injury. Inflammation has many forms and is mediated by a variety of different cytokines and other chemical signals. These mediators of inflammation include tumour necrosis factor-α (TNF-α), interleukin-1 (IL-1), interleukin-6 (IL-6), interleukin-8 (IL-8), and various colony-stimulating factors (CSFs).

As stated above, the peptides according to the invention are also suitable for treatment of tumours.

The peptides according to the invention may either be used as they are or be included in a medicinal product or a pharmaceutical preparation. The medicinal product or a pharmaceutical preparation according to the invention may also comprise substances used to facilitate the production of the pharmaceutical preparation or the administration of the preparations. Such substances are well known to people skilled in the art and may for example be pharmaceutically acceptable adjuvants, carriers and preservatives.

The peptides or medicinal products according to the invention can be administered to a patient either systemically or locally. The term "patient" used herein relates to any person at risk for or suffering from a dis-

ease state, disease progression or other abnormal or deleterious condition.

The systemic administration is suitable e.g. for treatment of urinary tract infection, colitis and tumours. The systemic administration can be undertaken by oral, nasal, intravenous, intraartery, intracavitary, intramuscular, subcutaneous, transdermal, suppositories (including rectal) or other routes known to those skilled in the art. Oral administration is preferred.

The local administration is suitable e.g. for treatment of skin infections, all infections and inflammations in mucosal membranes etc. The local administration can be undertaken by topical, oral, nasal, vaginal or oropharyngal route. For treatment of local infections or inflammations in the skin or mucosal membranes the peptides or medicinal products according to the invention may e.g. be included in a gel, a cream, an ointment, or a paste.

In the method according to the invention an effective amount of a peptide according to the invention is administered to a patient. The term "effective amount" used herein relates to an amount sufficient to treat or prevent a disease state, disease progression or other abnormal or deleterious condition.

The peptides or medicinal products and methods according to the invention are particularly well suited for treatment and/or prevention of urinary tract infection and colitis, but several other inflammatory and infectious diseases are also treatable according to the present invention, such as inflammatory bowel diseases, rheumatoid arthritis, conditions caused by the virus HIV-1, conditions caused by the virus CMV, and conditions caused by the fungi Candida albicans and Candida krusei. This listing is in no way limiting the scope of the invention.

The peptides, medicinal products and methods according to the invention are also well suited for preventive medical care by reducing the risk of developing urinary tract infection or other inflammatory or infectious dis-

eases in patients with an increased risk of attracting such complications.

The peptides, medicinal products and methods according to the invention may either be used alone, in combination with each other or in combination with conventional therapy.

According to the present invention it is also possible to include the peptides, in an effective amount, in any kind of food or beverage intended to reduce infections and/or inflammations in patients running an increased risk of such conditions due to an underlying disease or a medical treatment. For example, it is possible to include the peptides, in an effective amount, in an infant formula food intended to inhibit harmful effects of bacteria, such as weight loss caused by inflammation induced by bacteria, viruses or fungi in infants. When the peptides according to the invention is to be used in food stuffs, e.g. for nutritional purposes, it is especially preferred to use peptides of natural origin.

Since the peptides according to the invention have antimicrobial effects they can also be used as preservatives in different food stuffs and medicinal products such as gels, creams, ointments, pastes, solutions, emulsions etc.

Examples

In the examples below, 11 peptides according to the invention are used, namely the peptides with SEQ ID NO 2, 4, 6, 8, 9 11, 15, 19, 21, 22, and 25. Below, those peptides are called Peptide 2, Peptide 4, Peptide 6, Peptide 8, Peptide 9, Peptide 11, Peptide 15, Peptide 19, Peptide 21, Peptide 22, and Peptide 25, respectively, Also two similar references peptides, below called Reference 1 and Reference 2, are used.

Reference 1, a peptide with 10 amino acids, has the sequence:

Q-W-Q-R-N-M-R-K-V-R.

It thus resembles the peptide according to the invention with SEQ ID 2 (Peptide 2), with the exception that it lacks one amino acid, a phenylalanine, at the N-terminal end.

Reference 2, a peptide with 18 amino acids, has the sequence:

Q-P-E-A-T-K-C-F-Q-W-Q-R-N-M-R-K-V-R.

It thus resembles the peptide according to the invention with SEQ ID 24, with the exception that it includes one more amino acid, a glutamine, at the N-terminal end.

In the examples, the minimal microbicidal concentrations (MMC) and minimal inhibitory concentrations (MIC) were determined as follows, unless otherwise specified in the examples. Bacterial or fungal strains were cultured in BHI medium over night at 37°C. A volume of the culture was transferred to a new tube with BHI and incubated for two more hours. Thereafter the cells were spun down and the pellet was suspended in BHI medium diluted 1/100 (1% BHI). The concentration of bacterial or fungal cells was spectrophotometrically determined at 650 nm. The microbial concentrations were also determined by viable counts. Peptides serially diluted in 1% BHI by twofold or tenfold steps were added in triplicate to the wells of a microtiterplate (200 µl per well). The bacterial or fungal cell solutions were added in 10 µl volumes to give a final concentration of approximately 1-5 x 10^5 cells per ml in the well. The microplate was incubates at 37°C in a humid chamber for two hours. Thereafter 5 µl was taken from each well and added as a drop onto a blood agar plate and incubated over night at 37°C. The microplate was incubated for another 20 hours at 37°C and thereafter analysed spectrophotometrically at 650 nm in a microplate reader (Emax, Molecular Devices, USA). The concentration of peptide causing a 99% reduction of the inoculum after 2 hours of incubation was defined as the $MMC_{99\%}$. The MIC value was defined as the concentration giving no increase

in the absorbance value above the background level after 20 hours of incubation.

Example 1

In this example, the microbicidal and microbiostatic activity of the peptides according to the invention were tested and compared to the two references peptides.

C. albicans (ATCC64549) and E. coli O6, respectively, were incubated with the different peptides. The experiments were performed with 1, 10, 25 and 100 µg/ml of peptide. The results are shown in table 1.

Table 1

Peptide	C. albicans		E. coli	
	$MMC_{99\%}$	MIC	$MMC_{99\%}$	MIC
Peptide 2	10	10	10	10
Peptide 4	10	10	10	10
Peptide 6	10	10	10	10
Peptide 8	10	10	10	10
Peptide 9	10	10	10	10
Peptide 11	10	10	10	10
Peptide 15	25	10	10	10
Peptide 19	10	10	10	10
Peptide 21	10	10	10	10
Peptide 22	25	10	10	10
Peptide 25	10	10	10	10
Reference 1	25	25	> 25	> 25
Reference 2	100	10	25	10

From the table, it is evident that the peptides according to the invention have better microbicidal and microbiostatic activity than the reference peptides.

Example 2

In this example the activities of the peptides according to the invention on the killing of C. albicans

and on the inhibition of the growth of C. albicans were studied.

C. albicans yeast cells (ATCC64549) were incubated for 2 hours at pH 4.5 in BHI medium diluted to 1% of the original concentration containing 25 µg/ml of the peptide. Thereafter the fungal solutions were cultured on blood agar plates. OD_{650} was measured after incubation during an additional 18 hours.

The fungicidal effect of the peptides on C. albicans was determined as the ability of the peptide to kill 100% and 99%, respectively, of the fungus, while the growth inhibitory effect was determined by measuring the OD_{650}. An inhibitory effect existed when no increase in OD_{650} was recorded. The results are shown in table 2.

Table 2

Peptide	C. albicans		
	killing:		inhibition:
	100%	99%	
Peptide 2	−	−	−
Peptide 4	+	+	+
Peptide 6	+	+	+
Peptide 8	+	+	+
Peptide 9	+	+	+
Peptide 11	−	+	−
Peptide 15	+	+	+
Peptide 19	−	+	+
Peptide 20	−	+	+
Peptide 22	−	+	+
Peptide 24	−	+	+
Reference 1	−	−	−
Reference 2	−	−	−

killing: + = 100/99 % of the bacteria are killed
− = less than 100/99% of the bacteria are killed

inhibition: + = no increase in OD_{650} is seen
− = OD_{650} continues to increase

From the table, it is evident that the peptides according to the invention, especially Peptides 4, 6, 8, 9, and 15, have better effect on the killing and growth inhibition of C. albicans than the reference peptides.

Example 3

In this example, the peptides according to the invention were used to study the effect on the killing of different bacteria. The different bacteria used are shown in table 3.

The peptides were used at a concentration of 25 µg/ml.

The results are shown in table 3.

Table 3

Peptide	Bacteria				
	E. faecalis	S. epidermis	S. aureus	K. pneumoniae	P. aeruginosa
Peptide 2	+	+	+	−	−
Peptide 4	+	+	+	+	+
Peptide 6	+	+	+	+	+
Peptide 8	+	+	+	+	+
Peptide 9	+	+	+	+	+
Peptide 11	+	+	+	+	+
Peptide 15	+	+	+	+	+
Peptide 19	+	+	+	+	+
Peptide 20	+	+	+	+	+
Peptide 22	+	+	+	−	−
Peptide 24	+	+	+	−	−
Reference 1	−	+	−	−	−
Reference 2	+	+	+	−	−

+ = 99% of the bacteria are killed

− = less than 99% of the bacteria are killed

From the table, it is evident that the peptides according to the invention, especially Peptides 4-20, have better effect on the killing of bacteria than the reference peptides.

SEQUENCE LISTING

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<223> Description of Artificial Sequence:natural or artificial origin, corresp. to a modified vers. of the seq. consisting of aa 18-31 in human lactoferrin; lactams formed between aa 3 and 7, and aa 9 and 13

<220>
<221> BINDING
<222> (3)..(7)

<220>
<221> BINDING
<222> (9)..(13)

<400> 18
Thr Lys Lys Phe Gln Trp Asp Arg Lys Met Arg Lys Asp Arg
1 5 10

<210> 19
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:natural or artificial origin, corresp. to a modified vers. of the seq. consisting of aa 18-31 in human lactoferrin; lactams formed between aa 3 and 7, and aa 9 and 13

<220>
<221> MOD_RES
<222> (1)
<223> ACETYLATION

<220>
<221> MOD_RES
<222> (14)
<223> AMIDATION

<220>
<221> BINDING
<222> (3)..(7)

<220>
<221> BINDING
<222> (9)..(13)

<400> 19
Thr Lys Lys Phe Gln Trp Asp Arg Lys Met Arg Lys Asp Arg
1 5 10

<210> 20
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: natural or artificial origin, correponding to the sequence consisting of amino acids 17-31 in human lactoferrin

<400> 20
Ala Thr Lys Cys Phe Gln Trp Gln Arg Asn Met Arg Lys Val Arg
1 5 10 15

<210> 21
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<221> MOD_RES
<222> (1)
<223> ACETYLATION

<220>
<221> MOD_RES
<222> (15)
<223> AMIDATION

<220>
<223> Description of Artificial Sequence: natural or artificial origin, correponding to a modified version of the sequence consisting of amino acids 17-31 in human lactoferrin

<400> 21
Ala Thr Lys Cys Phe Gln Trp Gln Arg Asn Met Arg Lys Val Arg

<210> 22
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: natural or artificial origin, correponding to the sequence consisting of amino acids 16-31 in human lactoferrin

<400> 22
Glu Ala Thr Lys Cys Phe Gln Trp Gln Arg Asn Met Arg Lys Val Arg
1 5 10 15

<210> 23
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<221> MOD_RES
<222> (1)
<223> ACETYLATION

<220>
<221> MOD_RES
<222> (16)
<223> AMIDATION

<220>
<223> Description of Artificial Sequence: natural or artificial origin, correponding to a modified version of the sequence consisting of amino acids 16-31 in human lactoferrin

<400> 23
Glu Ala Thr Lys Cys Phe Gln Trp Gln Arg Asn Met Arg Lys Val Arg
1 5 10 15

<210> 24
<211> 17
<212> PRT

<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: natural or artificial origin, correponding to the sequence consisting of amino acids 15-31 in human lactoferrin

<400> 24
Pro Glu Ala Thr Lys Cys Phe Gln Trp Gln Arg Asn Met Arg Lys Val
1 5 10 15

Arg

<210> 25
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<221> MOD_RES
<222> (1)
<223> ACETYLATION

<220>
<221> MOD_RES
<222> (17)
<223> AMIDATION

<220>
<223> Description of Artificial Sequence: natural or artificial origin, correponding to a modified version of the sequence consisting of amino acids 15-31 in human lactoferrin

<400> 25
Pro Glu Ala Thr Lys Cys Phe Gln Trp Gln Arg Asn Met Arg Lys Val
1 5 10 15

Arg

CLAIMS

1. A peptide consisting of 11 - 17 amino acids comprising the sequence with SEQ ID NO 1, or functionally equivalent homologues or analogues thereof.

2. A peptide according to claim 1, wherein the amino acids denoted by Xaa are, independently of each other, Q, K, D, N, or V.

3. A peptide according to claim 2, having one of the sequences SEQ ID NO 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 21 or 24, or functionally equivalent homologues or analogues thereof.

4. A peptide according to claim 3, having one of the sequences SEQ ID NO 8, 10, 12, 14, 16 or 18, or functionally equivalent homologues or analogues thereof.

5. A peptide according to claim 2, wherein the N-terminal amino acid is acetylated and/or the C-terminal amino acid is amidated.

6. A peptide according to claim 5, having one of the sequences SEQ ID NO 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23 or 25, or functionally equivalent homologues or analogues thereof.

7. A peptide according to claim 6, having one of the sequences SEQ ID NO 9, 11, 13, 15, 17 or 19, or functionally equivalent homologues or analogues thereof.

8. A peptide according to claim 1 or 2, having a sequence essentially corresponding to one of the sequences SEQ ID NO 4-9 or 20-25 but wherein the cysteine has been replaced by a acetamidomethyl-cysteine, or functionally equivalent homologues or analogues thereof.

9. A medicinal product comprising a peptide according to any of the claims 1-8.

10. A medicinal product according to claim 9 for treatment and/or prevention of infections, inflammations and/or tumours.

11. A medicinal product according to claim 10, for treatment and/or prevention of urinary tract infection.

12. A medicinal product according to claim 10, for treatment and/or prevention of colitis.

13. A medicinal product according to any one of the claims 9-12 formulated for oral administration.

14. A medicinal product according to any one of the claims 9-12 formulated for parenteral administration.

15. A medicinal product according to claim 14 formulated for topical administration.

16. A medicinal product according to any one of the claims 9-15 formulated for administration on mucosal membranes.

17. Food stuff comprising a peptide according to any of the claims 1-8.

18. Food stuff according to claim 17 being an infant formula food.

19. Use of a peptide according to any one of the claims 1-8 for the production of a medicinal product for treatment and/or prevention of infections, inflammations and/or tumours.

20. Use according to claim 19, wherein the medicinal product is intended for treatment and/or prevention of urinary tract infection.

21. Use according to claim 19, wherein the medicinal product is intended for treatment and/or prevention of colitis.

22. Use according to any one of the claims 19-21, wherein the medicinal product is formulated for oral administration.

23. Use according to any one of the claims 19-21, wherein the medicinal product is formulated for parenteral administration.

24. Use according to claim 23, wherein the medicinal product is formulated for topical administration.

25. Use according to any one of the claims 19-24, wherein the medicinal product is formulated for administration on mucosal membranes.

26. Use according to claim 22, wherein the medicinal product constitutes or is included in a food stuff.

27. Use according to claim 26, wherein the food stuff is an infant formula food.

28. A method for treatment or prevention of infections, inflammations or tumours wherein an effective amount of a substance chosen from the group consisting of the peptides having any of the sequences SEQ ID NO 1-25, fragments, and functionally equivalent homologues and analogues thereof, is administered to a patient.

29. A method according to claim 28 for treatment and/or prevention of urinary tract infection.

30. A method according to claim 28 for treatment and/or prevention of colitis.

31. A method according to any one of the claims 28, wherein the substance is orally administered.

32. A method according to any one of the claims 28, wherein the substance is parenterally administered.

33. A method according to claim 32, wherein the substance is topically administered.

34. A method according to any one of the claims 33, wherein the substance is administered on mucosal membranes.

35. A method according to claim 31, wherein the substance is included in food stuff.

36. A method according to claim 35, wherein the substance is included in an infant formula food.

ABSTRACT

The invention relates to new peptides consisting of 11 - 17 amino acids comprising the sequence with SEQ ID NO 1, or functionally equivalent homologues or analogues thereof.

The invention also relates to medicinal products comprising such peptides, especially intended for treatment and prevention of infections, inflammations and tumours.

Furthermore, the invention relates to food stuff, e.g. infant formula food, comprising the above mentioned peptides.